



January 14, 2013

Mr. Ayman Ghobrial
PA Department of Environmental Protection
Southeast Regional Office
2 East Main Street
Norristown, PA 19401

**Re: Soil Screening Procedure for
Philadelphia Energy Solutions, Philadelphia Refinery**

Dear Mr. Ghobrial:

Sunoco is pleased to present this revised approach to develop a screening process for soils at the Philadelphia Energy Solutions (PES) Facility (Facility) as discussed in the January 3, 2013 meeting with the Pennsylvania Department of Environmental Protection (PADEP), Sunoco, Inc. R&M (Sunoco), PES and Langan Engineering and Environmental Services (Langan). Sunoco is submitting this letter to document the soil screening approach discussed during the meeting.

The compounds of concern (COC) for the Facility include the parameters listed in the Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001 [provided in Chapter VI, Section E of PADEP's Closure Requirements for Underground Storage Tank Systems (263-4500-601) revised September 8, 2012] in addition to 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. The complete list of the COCs is provided in the table below.

1: Parameter List

Metals	
Lead (total)	7439-92-1
Volatile Organic Compounds	
1,2-Dichloroethane	107-06-2
1,2-Dibromoethane (Ethylene dibromide)	106-93-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

Semi-Volatile Organic Compounds	
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo (g,h,i) perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

The process outlined in this approach will be followed for these COCs as well as any for any additional compounds included in soil sampling activities, as appropriate.

Soil Screening Procedure

The tiered screening procedure developed for the Facility is based on the current and anticipated future non-residential use of the site and is shown in Figure 1. In accordance with 25 PA Code§ 250.305 and PADEP's Technical Guidance Manual ("TGM"), compounds detected in soil will be first screened against the respective non-residential (surface or sub-surface) soil medium specific concentration (MSC) and any compounds that exceed the MSC will be further screened against the EPA's Industrial Soil Regional Screening Levels (RSL). Because, as discussed during the January 3rd meeting, the groundwater exposure pathway at the Facility is incomplete for human receptors and groundwater impacts are evaluated via the groundwater and/or surface water pathway, a third screening step is proposed prior to calculating site-specific criteria and completing a cumulative risk assessment. The third step in the screening process compares any compounds that exceed the PADEP Non-Residential MSC and the EPA's Industrial Soil RSL against the PADEP's Non- Residential direct contact MSC. To maintain conservancy, all soil samples will be screened against the more conservative 0-2 feet below grade (fbg) direct contact criteria regardless of sample depth in case the soils are re-used elsewhere on the Facility. This approach assumes that all soils will be addressed under the pathway elimination option with the Site Specific Standard, unless a calculated risk based standard is used with the Site Specific Standard.

The process for evaluating vapor intrusion and potential ecological impacts from soil are not addressed in this approach. Should concentrations in soil in areas of current or future inhabited buildings exceed acceptable vapor intrusion screening limits these locations will be identified and addressed through soil gas or indoor air sampling or alternatively vapor mitigation measures can be installed to eliminate the vapor intrusion pathway. Similarly, potential ecological impacts will be evaluated on an AOI specific basis and appropriate ecological based criteria will be utilized in those areas.

Any soil data collected at the refinery will be evaluated using the procedure outlined above. Soil data summary tables will be provided with each Act 2 report that will highlight the data in comparison to each of the above specified criteria. Any compounds that exceed the PADEP Non-Residential Soil MSC, EPA Industrial Soil RSL, and PADEP Direct Contact Screening Value will be carried through a cumulative risk assessment. Consistent with the PADEP TGM and the current approach for the Remedial Investigation Reports submitted to-date, compounds detected below the screening criteria will not be considered to contribute significantly to risk

and will not be carried through the cumulative risk assessment. The cumulative risk assessment, described below, will be completed in accordance with the TGM.

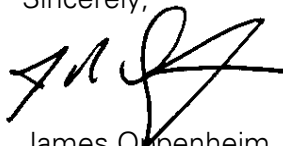
Cumulative Risk Calculation [AOI-Specific]

As discussed above, any compounds with concentrations detected above the soil MSCs, EPA Region 3 RSLs, and direct contact numeric values will be carried through a cumulative risk assessment, with the exception of lead as is discussed below. In accordance with the PADEP's Technical Guidance Manual ("TGM"), the total cumulative risk should not exceed $1E-4$ for carcinogenic compounds and the hazard index ("HI") should not exceed 1 for non-carcinogenic compounds. For the cumulative risk assessment, the 95th percent upper confidence limit (UCL_{95}) of the mean soil COC concentration will be utilized as the exposure point concentration ("EPC"). The UCL_{95} is used as an appropriate estimate of concentrations likely to be contacted over time, and is the recommended exposure point concentration in human health risk assessments, except in cases where the UCL_{95} is higher than the maximum concentration. UCL_{95} values for soil will be derived using EPA's ProUCL Version 4.1 software. Risk will be calculated for each individual carcinogenic compound using the EPC and the total cumulative risk will be the sum of the risk for all carcinogens. Similarly, the hazard quotient ("HQ") will be calculated for each individual non-carcinogenic compound [based on the EPC] and the HI will be the sum of all of the individual HQs.

The only exception to this process is lead which, as described in 25 Pa. Code § 250.306(e), is derived from methodology presented in the report 'The Society for Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead in Soil' (Wixson, 1991) and this process does not allow for the calculation of a cumulative risk for lead. Attachment A presents the proposed process for the development of the site specific standards for lead in accordance with 25 Pa. Code § 250.306(e).

If you have any questions or require more information, please feel free to contact me at (610) 833-3444 or jroppenheim@sunocoinc.com. If you agree with the above approach, please email me written acceptance. As always, I appreciate your time and continued cooperation.

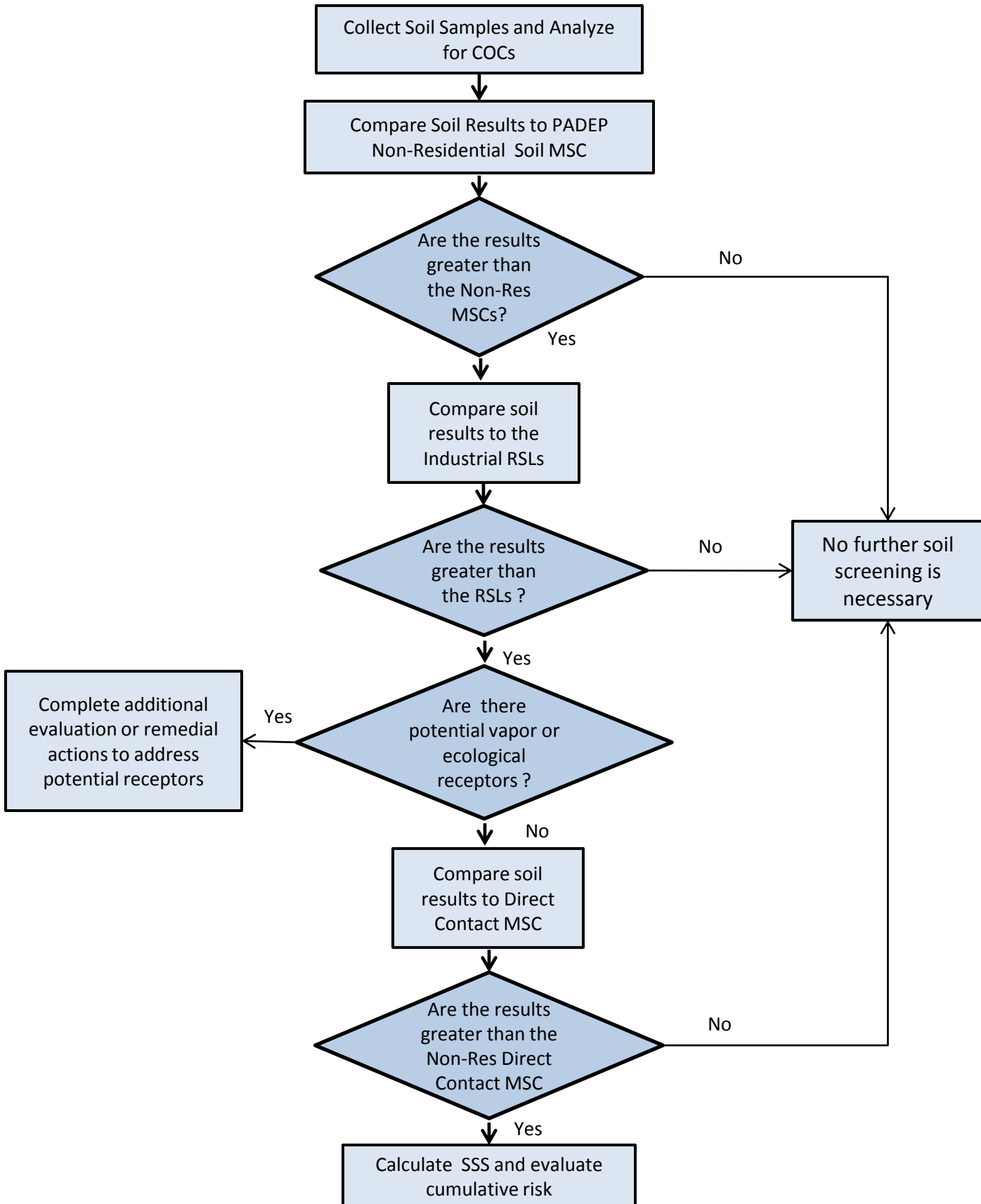
Sincerely,



James Oppenheim, PE
Sr. Environmental Consultant

cc: Charles D. Barksdale, PES
Colleen Costello, PG, Langan Engineering
Allison Jelinek, GISP, Langan Engineering

Figure 1
Soil Screening Process



Attachment A

The site-specific screening level for lead is calculated based on ingestion as presented in 25 Pa. Code § 250.306(e), Appendix A, Table 7. As described in 25 Pa. Code § 250.306(e), the non-residential soil screening value for lead is derived from methodology presented in the report 'The Society for Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead in Soil' (Wixson, 1991). Based on the SEGH model and PADEP's default parameters, PADEP's non-residential direct contact MSC default value for lead in soil is 1,000 mg/kg. To develop a site-specific criterion for lead, the values used by PADEP for the target blood lead concentration (T) and geometric mean background blood lead concentration (B) are revised in consideration of site-specific conditions and updated lead data collected by the US Center for Disease Control and Prevention (CDC). The basis for these revised parameters is detailed below and has been previously approved by PADEP and EPA for the Philadelphia Refinery.

Target blood lead concentration (T) – The default target blood lead concentration used by the PADEP to develop the non-residential MSC is 20 ug/dL; however, the Center for Disease Control (CDC) recommends that worker blood lead levels be maintained below 25 ug/dL (NIOSH, 2008) to prevent adverse health effects for most workers from exposure to lead throughout a working lifetime. Based on conversations between representatives of Sunoco and EPA, the target lead blood level identified by the CDC is the level used in the site-specific calculations.

Geometric mean background blood lead concentration (B) – B is the background blood lead concentration in the target population from sources other than soil and dust. The PADEP's default value for B is 4 ug/dL and, as summarized in PADEP's reference document (Wixson, 1991), is based on data gathered in the United Kingdom from young children. The CDC has monitored blood lead levels in US children and adults since 1976 and, based on the most recent results published by the National Center for Environmental Health of the CDC (NCEH, Page I-3 2005), the mean blood lead concentration for an adult 20 years of age or older is 1.56 ug/dL. Based on the more recent study by the US CDC, the value used for B in the site-specific calculation has been revised to 1.56 ug/dL.

Exposure Assumptions

Variable	Value	Unit	Source
T (blood lead target concentration) ¹	25	ug/dL	CDC – ABLES (NIOSH, 2008)
G (geometric standard deviation of the blood lead distribution)	1.4	unitless	25 Pa. Code § 250, Appendix A Table 7
B (Background blood lead concentration)	1.56	ug/dL	NCEH Pub. No. 05-0570 (NCEH, 2005)
n (number of standard deviations)	1.645	unitless	25 Pa. Code § 250, Appendix A Table 7
δ (response of the blood lead vs. soil lead)	7.5	ug/dL blood / ug/g soil	25 Pa. Code § 250, Appendix A Table 7

¹ Sources for blood lead target level (T) based on conversation between James Oppenheim of Sunoco and Hon Lee of EPA in November 2010. NIOSH (2008). Adult Blood Lead Epidemiology and Surveillance (ABLES). <http://www.cdc.gov/niosh/topics/ABLES>
NCEH (2005). Third National Report on Human Exposure to Environmental Chemicals. Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Laboratory Sciences. Atlanta, Georgia. NCEH. Pub. No. 05-0570.